CLAIMS

What is claimed is:

1. A field effect transistor comprising:

a source;

a drain;

a gate;

at least one carbon nanotube on the gate; and

a dielectric layer that coats the gate and a portion of the at least one carbon nanotube, wherein the at least carbon nanotube has an exposed portion that is not coated with the dielectric layer, and wherein the exposed portion is functionalized with at least one indicator molecule.

2. The field effect transistor of claim 1, wherein the at least one carbon nanotube is a single-walled carbon nanotube.

3. The field effect transistor of claim 1, wherein the dielectric layer comprises silica.

4. The field effect transistor of claim 1, wherein the dielectric layer coats the source and the drain.

5. The field effect transistor of claim 1, wherein the indicator molecule is a DNA oligo.

6. The field effect transistor of claim 5, wherein the DNA oligo is specific for a DNA sequence.

7. The field effect transistor of claim 1, wherein the indicator molecule is a polypeptide.

8. The field effect transistor of claim 1, wherein the field effect transistor is a biochem-FET.

9. A method for making a transistor, comprising:

(A) providing a field effect transistor comprising a source, a gate, and a drain, wherein at least one nanotube is on the gate;

(B) coating the at least one nanotube and the gate with a dielectric layer;

(C) etching a portion of the at least one nanotube to provide an exposed nanotube portion; and

(D) functionalizing the exposed nanotube portion.

10. The method of claim 9, wherein the transistor is a biochem-FET.

11. The method of claim 9, wherein step (A) further comprises growing the at least one nanotube to provide the at least one nanotube on the gate.

12. The method of claim 9, wherein step (A) further comprises attaching the at least one nanotube to the gate to provide the at least one nanotube on the gate.

13. The method of claim 9, wherein step (B) is accomplished by liquid phase deposition.

14. The method of claim 9, wherein step (B) further comprises coating the source and the drain.

15. The method of claim 9, wherein the dielectric layer comprises silica.

16. The method of claim 9, wherein step (C) is accomplished by HF.

17. The method of claim 9, wherein step (D) is accomplished by chemical functionalization.

18. The method of claim 17, wherein chemical functionalization comprises hydroxylation.

19. The method of claim 9, wherein functionalizing the exposed nanotube portion of step (D) comprises attaching at least one indicator molecule to the exposed nanotube portion.

20. The method of claim 19, wherein the at least one indicator molecule is chemically sensitive and interacts with at least one target molecule.

21. The method of claim 19, wherein the indicator molecule comprises a DNA oligo.

22. The method of claim 21, wherein the DNA oligo is specific for a target molecule comprising a DNA sequence.

23. The method of claim 19, wherein the indicator molecule comprises a polypeptide.

24. A biochem-FET, comprising:

a FET having a gate;

at least one carbon nanotube on the gate; and

a dielectric layer that coats the gate and a portion of the at least one carbon nanotube, wherein the at least one carbon nanotube has an exposed portion that is not coated with the dielectric layer; and

at least one indicator molecule on the exposed portion.

25. The biochem-FET of claim 24, wherein the at least one carbon nanotube is a single-walled carbon nanotube.

26. The biochem-FET of claim 24, wherein the dielectric layer comprises silica.

27. The biochem-FET of claim 24, wherein the at least one indicator molecule comprises a DNA oligo.

28. The biochem-FET of claim 27, wherein the DNA oligo is specific for a target molecule comprising a DNA sequence.

29. The biochem-FET of claim 24, wherein the at least one indicator molecule comprises a polypeptide.

30. A biochem-FET array, comprising:

a plurality of biochem-FETs wherein each biochem-FET comprises

a FET having a gate;

at least one carbon nanotube on the gate;

a dielectric layer that coats the gate and a portion of the at least one carbon nanotube; wherein the at least one carbon nanotube has an exposed portion that is not coated with the dielectric layer; and

at least one indicator molecule on the exposed portion; and

a substrate.

31. The biochem-FET array of claim 30, wherein the at least one carbon nanotube is a single-walled carbon nanotube.

32. The biochem-FET array of claim 30, wherein the dielectric layer comprises silica.

33. The biochem-FET array of claim 30, wherein the at least one indicator molecule comprises a DNA oligo.

34. The biochem-FET array of claim 33, wherein the DNA oligo is specific for a target molecule comprising a DNA sequence.

35. The biochem-FET array of claim 30, wherein the at least one indicator molecule comprises a polypeptide.

36. The biochem-FET array of claim 30, wherein the substrate comprises silicon.